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ABSTRACT

Standardized curricula are provided for two courses for the secondary vocational education program in Mississippi: electrician I and II. The 11 units in electrician I are as follows: orientation; safety; tools, equipment, materials/supplies; basic principles and theory; DC circuits; AC circuits; blueprints and load calculations; load centers and overcurrent protection; rough-in; residential service; and trim out and troubleshooting. Electrician II consists of seven units: orientation and safety review; special tools and equipment; transformers; wiring design; motors; controllers; and programmable controls. Each unit consists of these components: objectives, with core/essential objectives indicated; suggested instructional practices; list of suggested resources; list of evaluation and suggested minimum performance standards, with core/essential objectives indicated; and performance record, with core/essential objectives indicated. A checklist for each course combining all unit performance standards into a single list is included. (YLB)

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STANDARDIZED CURRICULUM

FOR

ELECTRICIAN

MISSISSIPPI DEPARTMENT OF EDUCATION

OFFICE OF VOCATIONAL, TECHNICAL

AND ADULT EDUCATION

June 1989

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FOREWORD

This volume is intended to be used in the State of Mississippi as a mechanism for standardizing vocational education course titles and core contents. The need for standardization of curricula was triggered by provisions in the Educational Reform Act of 1982 which mandated:

-- elimination of nearly all currently existing curriculum requirements and development of new curriculum content that is "properly sequenced" and "coordinated";

-- steps to ensure that students master one level of course work before being advanced to the next level and that progression is properly sequenced;

-- a criterion-referenced, state-wide testing program that is built upon an identified set of "basic skills" keyed to student performance in grades 3, 5, 8, and 11;

-- revised graduation requirements that take into account student performance on the basic skills and also on a test of "functional literacy skills"; and

-- a system of accrediting schools that takes into account the performance of districts, schools, and students.

In addition to the mandates of the Educational Reform Act, the Strategic Plan for Vocational and Technical Education in Mississippi also calls for improving the quality of vocational and technical education through the standardization of curricula and the articulation of secondary and postsecondary programs.

Both of these mandates were further reinforced by legislation passed in 1986 which called for the establishment of state-wide "guidelines and procedures for managing an instructional program in the public schools." This legislation calls for instructional management plans containing the following components:

1. a written list of learning objectives for every course for which academic credit is given on students' transcripts (state specified core objectives must be included);

2. <u>suggested</u> instructional practices and resources for the learning objectives;

3. standards for student performance for each learning objective; and

4. systematic procedures for evaluating student performance on the learning objectives.

Specific local district actions regarding the state-wide instructional management plan are also required, namely:

1. The objectives contained in this document are common to all programs in the state. Core objectives are designated with an asterisk. The local district is encouraged to add additional objectives to this listing to meet local needs of students and employers.

2. The local school board must officially adopt the learning objectives as the district's curricula.

3. Pass/fail policies must be based on mastery of learning objectives.

4. Student performance on the learning objectives must be systematically evaluated at least once during the school year.

5. During the school year, records of individual student performance must indicate whether or not the objectives have been mastered. The record must indicate mastery status for each of the objectives tested in the Basic Skills Assessment Program (including functional literacy skills) and must be permanently maintained on all students who do <u>not</u> master the basic and functional literacy skills prior to being tested on them.

6. Each year, information about student performance on learning objectives must be reviewed. Those objectives which students are not mastering must be identified, and a plan must be developed for improving student performance on those objectives.

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ELECTRICIAN I

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ELECTRICIAN I

Unit No.	Title
1	Orientation
2	Safety
3	Tools, Equipment, Materials/Supplies
4	Basic Principles and Theory
5	DC Circuits
6	AC Circuits
7	Blueprints and Load Calculations
8	Load Centers and Overcurrent Protection
9	Rough-in
10	Residential Service
11	Trim Out and Troubleshooting

COURSE: Electrician I

Unit 1: Orientation

Objectives: Upon completion of this unit, the student will:

*1. List job responsibilities of electrical workers.
2. Identify employment opportunities for electrical workers.
3. Identify local program and vocational center policies and procedures.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan; Flowers, Gary; and Don Blasingame. Basic Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

(Local school policies and procedures will have to be supplied by the instructor for Objective 3.)

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will list eight job responsibilities of electrical workers.
Objective 2: The student will identify six employment opportunities for electrical workers.
Objective 3: The student will identify local program and vocational center policies and procedures as determined by the local instructor.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Listed job responsibilities of electrical workers.
____ 2. Identified employment opportunities for electrical workers.
____ 3. Identified local program and vocational center policies and procedures.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 2: Safety

Objectives: Upon completion of this unit, the student will:

*1. List personal safety rules for working in a shop.
*2. List general safety rules.
3. Describe the proper use of the different classes of fire extinguishers on the different classes of fires.
*4. Identify uses of the colors of the Safety Color Code.
5. State the steps in lifting an object safely.
*6. List safety practices for step ladders, extension ladders, scaffolds, and power lifts.
*7. List factors to consider in storing hazardous materials.
8. Identify hazardous materials that may be found on a job site.
*9. State basic electrical safety practices.
*10. State safety practices for working with live circuits.
*11. Identify statements concerning proper grounding.
*12. Identify statements concerning the importance of the third wire.
*13. Describe the use of ground fault interrupters.
*14. Identify steps to follow in treating a victim for electrical shock.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan; Flowers, Gary; and Don Blasingame. Basic Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will list seven personal safety rules for working in a shop.
*Objective 2: The student will list 16 general safety rules that apply to shops and work sites.
Objective 3: The student will describe the proper use of each different class of fire extinguisher on the different classes of fires.
*Objective 4: The student will identify two uses of the six colors of the Safety Color Code.

Objective 5: The student will state three steps in lifting an object safely in their proper order.

*Objective 6: The student will list eight safety practices for step ladders, extension ladders, scaffolds, and power lifts.

*Objective 7: The student will list four factors to consider in storing hazardous materials.

Objective 8: The student will identify two hazardous materials that may be found on a job site.

*Objective 9: The student will state ten basic electrical safety practices.

*Objective 10: The student will state five safety practices for working with live circuits.

*Objective 11: The student will identify four statements concerning proper grounding.

*Objective 12: The student will identify three statements concerning the importance of the third wire.

*Objective 13: The student will describe three factors relating to the use of ground fault interrupters.

*Objective 14: The student will identify four major steps to follow in treating a victim for electrical shock.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Listed personal safety rules for working in a shop.
____ *2. Listed general safety rules.
____ *3. Described the proper use of the different classes of fire extinguishers on the different classes of fires.
____ *4. Identified uses of the colors of the Safety Color Code.
____ 5. Stated the steps in lifting an object safely.
____ *6. Listed safety practices for step ladders, extension ladders, scaffolds, and power lifts.
____ *7. Listed factors to consider in storing hazardous materials.
____ 8. Identified hazardous materials that may be found on a job site.
____ *9. Stated basic electrical safety practices.
____ *10. Stated safety practices for working with live circuits.
____ *11. Identified statements concerning proper grounding.
____ *12. Identified statements concerning the importance of the third wire.
____ *13. Described the use of ground fault interrupters.
____ *14. Identified steps to follow in treating a victim for electrical shock.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 3: Tools, Equipment, and Materials/Supplies

Objectives: Upon completion of this unit, the student will:

*1. Identify common and electrical specialty tools used in electrical trades and state the use of each tool.
*2. Use a cutting/crimping tool.
*3. Measure objects using a rule.
*4. Identify classes of outlet boxes used in electrical wiring.
*5. Identify types of devices used in electrical wiring.
6. Identify types of covers and plates used in electrical wiring.
7. Identify types of supports and anchors used in electrical wiring.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan; Flowers, Gary; and Don Blasingame. Basic Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify 35 common and electrical specialty tools used in electrical trades and state the use of each tool.
*Objective 2: The student will demonstrate the use of a cutting/crimping tool.
*Objective 3: The student will measure objects using a rule to the nearest +/- 1/16th inch.
*Objective 4: The student will identify four classes of outlet boxes used in electrical wiring.
*Objective 5: The student will identify 14 types of receptacles, sockets, and switches used in electrical wiring.
Objective 6: The student will identify four types of covers and seven types of plates used in electrical wiring.
Objective 7: The student will identify seven types of supports and anchors used in electrical wiring.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified common and electrical specialty tools used in electrical trades and stated the use of each tool.
____ *2. Used a cutting/crimping tool.
____ *3. Measured objects using a rule.
____ *4. Identified classes of outlet boxes used in electrical wiring.
____ *5. Identified types of devices used in electrical wiring.
____ 6. Identified types of covers and plates used in electrical wiring.
____ 7. Identified types of supports and anchors used in electrical wiring.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 4: Basic Theory and Principles

Objectives: Upon completion of this unit, the student will:

1. Define terms associated with basic theory.
2. State principles of electron flow.
3. State the basic sources of generation.
4. Trace the distribution route for electricity.
*5. Identify electrical schematic symbols.
*6. Distinguish between a diagram and a schematic.
*7. Identify letters and terms used in electrical formulas.
*8. State Ohm's law and its uses.
*9. Calculate voltage, amperage, and resistance using Ohm's law.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan; Flowers, Gary; and Don Blasingame. Basic Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will define the following terms associated with basic theory: amp, electricity, electron flow, ohm, volt, and watt.
Objective 2: The student will state four principles of electron flow.
Objective 3: The student will state five basic sources of generation.
Objective 4: The student will draw a diagram which traces the distribution route for electricity from generating plant to point of use.
*Objective 5: The student will identify ten commonly used electrical schematic symbols.
*Objective 6: The student will state one distinguishing characteristic between a diagram and a schematic.
*Objective 7: The student will identify the following letters and terms used in electrical formulas: E, I, R, and P.
*Objective 8: The student will state Ohm's law and identify two of its uses.

*Objective 9: The student will calculate voltage, amperage, and resistance using Ohm's law.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ 1. Defined terms associated with basic theory.
____ 2. Stated principles of electron flow.
____ 3. Stated the basic sources of generation.
____ 4. Traced the distribution route for electricity.
____ *5. Identified electrical schematic symbols.
____ *6. Distinguished between a diagram and a schematic.
____ *7. Identified letters and terms used in electrical formulas.
____ *8. Stated Ohm's law and its uses.
____ *9. Calculated voltage, amperage, and resistance using Ohm's law.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 5: DC Circuits

Objectives: Upon completion of this unit, the student will:

*1. State applications of DC circuits.
*2. Apply Ohm's law to DC.
*3. State characteristics of series circuits and calculate relationships.
*4. State Watt's law.
5. State Kirchoff's voltage law.
*6. State characteristics of parallel circuits and calculate relationships.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion

Suggested Resources:

Primary Resource: Kaltwasser, Stan; Flowers, Gary; and Don Blasingame. Basic Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will state six applications of DC circuits.
*Objective 2: The student will apply Ohm's law to DC circuits to calculate current, resistance, and voltage.
*Objective 3: The student will state four characteristics of series circuits and calculate relationships among the characteristics.
*Objective 4: The student will state Watt's law.
Objective 5: The student will state Kirchoff's voltage law.
*Objective 6: The student will state two characteristics of parallel circuits and calculate relationships.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Stated applications of DC circuits.
____ *2. Applied Ohm's law to DC.
____ *3. Stated characteristics of series circuits and calculated relationships.

____ *4. Stated Watt's law.
____ 5. Stated Kirchoff's voltage law.
____ *6. Stated characteristics of parallel circuits and calculated relationships.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 6: AC Circuits

Objectives: Upon completion of this unit, the student will:

1. State facts concerning magnetism.
2. Describe how magnetism relates to principles of induction.
3. State the characteristics of inductance.
*4. List principles of AC theory.
*5. List factors that determine the type and size of conductors.
*6. State characteristics of a good connection.
7. Identify different types of connectors, terminals, and lugs.
*8. Identify types of cables used in the electrical field.
*9. Wire a single pole switch controlling a single lighting outlet with the supply line entering the switch box.
*10. Wire a single pole switch controlling a single lighting outlet with the supply line entering the outlet box.
*11. Wire a three-way switching situation with the supply line entering a single outlet lighting outlet.
*12. Wire a four-way switching situation with the supply line entering the outlet box.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan; Flowers, Gary; and Don Blasingame. Basic Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will state five facts concerning magnetism.
Objective 2: The student will describe four ways by which magnetism relates to principles of induction.
Objective 3: The student will state three characteristics of inductance.
*Objective 4: The student will list four principles of AC theory.
*Objective 5: The student will list five factors that determine the type and size of conductors.
*Objective 6: The student will state four characteristics of a good connection.

Objective 7: The student will identify eight different types of connectors, terminals, and lugs.

*Objective 8: The student will identify the following types of cables used in the electrical field: NM, UF, SE, and AC.

*Objective 9: The student will wire a single pole switch controlling a single lighting outlet with the supply line entering the switch box to NEC requirements.

*Objective 10: The student will wire a single pole switch controlling a single lighting outlet with the supply line entering the outlet box to NEC requirements.

*Objective 11: The student will wire a three-way switching situation with the supply line entering a single outlet lighting outlet to NEC requirements.

*Objective 12: The student will wire a four-way switching situation with the supply line entering the outlet box to NEC requirements.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ 1. Stated facts concerning magnetism.
____ 2. Described how magnetism relates to principles of induction.
____ 3. Stated the characteristics of inductance.
____ *4. Listed principles of AC theory.
____ *5. Listed factors that determine the type and size of conductors.
____ *6. Stated characteristics of a good connection.
____ 7. Identified different types of connectors, terminals, and lugs.
____ *8. Identified types of cables used in the electrical field.
____ *9. Wired a single pole switch controlling a single lighting outlet with the supply line entering the switch box.
____*10. Wired a single pole switch controlling a single lighting outlet with the supply line entering the outlet box.
____*11. Wired a three-way switching situation with the supply line entering a single outlet lighting outlet.
____*12. Wired a four-way switching situation with the supply line entering the outlet box.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 7: Blueprints and Load Calculations

Objectives: Upon completion of this unit, the student will:

*1. Identify symbols used in residential drawings.
*2. Identify electrical symbols used in residential drawings.
*3. Identify the different types of lines used in blueprints.
*4. List information commonly found in blueprint specifications.
*5. State minimum requirements for residential outlets.
*6. Calculate circuit loads and voltage drop of dwelling.
*7. Determine total connected load plus total demand load of a dwelling.
*8. Select proper materials for a specific job.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion

Suggested Resources:

Primary Resource: Taylor, Mark. Rev. by Don Blasingame and Gary Flowers. Residential Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify 18 symbols used in residential drawings to represent appliances, fixtures, and structures.
*Objective 2: The student will identify 24 electrical symbols used in residential drawings to represent convenience outlets, switches, and panels and circuits.
*Objective 3: The student will identify five different types of lines used in blueprints.
*Objective 4: The student will list six types of information commonly found in blueprint specifications.
*Objective 5: The student will state minimum requirements for the following residential outlets: receptacles, switches, and lighting.
*Objective 6: The student will calculate circuit loads and voltage drop of dwelling.
*Objective 7: The student will determine total connected load plus total demand load of a dwelling.

*Objective 8: Given a blueprint or plan for a specific job, the student will prepare a list of all materials required to complete the job to NEC standards.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified symbols used in residential drawings.
____ *2. Identified electrical symbols used in residential drawings.
____ *3. Identified the different types of lines used in blueprints.
____ *4. Listed information commonly found in blueprint specifications.
____ *5. Stated minimum requirements for residential outlets.
____ *6. Calculated circuit loads and voltage drop of dwelling.
____ *7. Determined total connected load plus total demand load of a dwelling.
____ *8. Selected proper materials for a specific job.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 8: Load Centers and Overcurrent Protection

Objectives: Upon completion of this unit, the student will:

*1. List the types of overcurrent protective devices.
2. Describe the operation of a single element and dual element time delay fuse.
3. Name the different types of circuit breakers.
4. List requirements for fuses of less than 600 volts.
5. List requirements for circuit breakers of less than 600 volts.
*6. Identify installations that require GFCI protection.
7. Identify types of safety switch enclosures.
8. Identify types of load centers and enclosures.
9. Identify load center accessories and state the use of each.
10. Identify parts of a fusible load center.
11. Identify parts of a breaker load center.
*12. State safety rules for working around load centers and safety switches.
*13. Install a safety switch.
*14. Wire a load center or breaker panel.
*15. Wire a receptacle circuit to load center.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan; Flowers, Gary; and Don Blasingame. Basic Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will list the four types of overcurrent protective devices.
Objective 2: The student will describe the operation of a single element and dual element time delay fuse under sustained overload conditions.
Objective 3: The student will name two different types of circuit breakers.
Objective 4: The student will list six requirements for fuses of less than 600 volts.
Objective 5: The student will list four requirements for circuit breakers of less than 600 volts.

*Objective 6: The student will identify five installations that require GFCI protection.

Objective 7: The student will identify three types of safety switch enclosures.

Objective 8: The student will identify three types of load centers and enclosures.

Objective 9: The student will identify seven load center accessories and state the use of each.

Objective 10: The student will identify five parts of a fusible load center.

Objective 11: The student will identify four parts of a breaker load center.

*Objective 12: The student will state four safety rules for working around load centers and safety switches.

*Objective 13: The student will install a safety switch to NEC standards.

*Objective 14: The student will wire a load center or breaker panel to NEC standards.

*Objective 15: The student will wire a receptacle circuit to load center to NEC standards.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Listed the types of overcurrent protective devices.
____ 2. Described the operation of a single element and dual element time delay fuse.
____ 3. Named the different types of circuit breakers.
____ 4. Listed requirements for fuses of less than 600 volts.
____ 5. Listed requirements for circuit breakers of less than 600 volts.
____ *6. Identified installations that require GFCI protection.
____ 7. Identified types of safety switch enclosures.
____ 8. Identified types of load centers and enclosures.
____ 9. Identified load center accessories and stated the use of each.
____ 10. Identified parts of a fusible load center.
____ 11. Identified parts of a breaker load center.
____ *12. Stated safety rules for working around load centers and safety switches.
____ *13. Installed a safety switch.
____ *14. Wired a load center or breaker panel.
____ *15. Wired a receptacle circuit to load center.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 9: Rough-in

Objectives: Upon completion of this unit, the student will:

*1. Name locations where at least one receptacle is required.
2. List planning techniques when placing boxes on plans.
*3. State acceptable heights for boxes in various locations.
4. Describe the steps in installing boxes in exterior walls to be brick veneered.
*5. Describe the required outlets for various living areas in a residence.
6. List rules for electrical installations.
*7. Install a device box when given cabinet height and wall covering.
*8. Install a ceiling box when given ceiling covering thickness.
*9. Wire a switch controlled split-wired receptacle.
*10. Wire a receptacle fed from a lighting outlet through a single pole switch.
*11. Wire a receptacle fed from a lighting outlet through a three-way switch.
*12. Wire a four-way switching situation with the supply line entering the lighting box.
*13. Wire a range or dryer receptacle.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Taylor, Mark. Rev. by Don Blasingame and Gary Flowers. Residential Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will name four locations where at least one receptacle is required.
Objective 2: The student will list three planning techniques when placing boxes on plans.
*Objective 3: The student will state acceptable heights for boxes in the following locations: above kitchen counter tops, above bathroom cabinets, receptacles along the floor line, and wall switches.

Objective 4: The student will describe four steps in installing boxes in exterior walls to be brick veneered.

*Objective 5: The student will describe the required outlets for the following living areas in a residence: general provisions, counter tops, bathrooms, outdoors, laundry areas, basements and attached garages, and lighting outlets.

Objective 6: The student will list five rules for electrical installations.

*Objective 7: The student will install a device box when given cabinet height and wall covering to NEC standards.

*Objective 8: The student will install a ceiling box when given ceiling covering thickness to NEC standards.

*Objective 9: The student will wire a switch controlled split-wired receptacle to NEC standards.

*Objective 10: The student will wire a receptacle fed from a lighting outlet through a single pole switch to NEC standards.

*Objective 11: The student will wire a receptacle fed from a lighting outlet through a three-way switch to NEC standards.

*Objective 12: The student will wire a four-way switching situation with the supply line entering the lighting box to NEC standards.

*Objective 13: The student will wire a range or dryer receptacle to NEC standards.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Named locations where at least one receptacle is required.
____ 2. Listed planning techniques when placing boxes on plans.
____ *3. Stated acceptable heights for boxes in various locations.
____ 4. Described the steps in installing boxes in exterior walls to be brick veneered.
____ *5. Described the required outlets for various living areas in a residence.
____ 6. Listed rules for electrical installations.
____ *7. Installed a device box when given cabinet height and wall covering.
____ *8. Installed a ceiling box when given ceiling covering thickness.
____ *9. Wired a switch controlled split-wired receptacle.
____ *10. Wired a receptacle fed from a lighting outlet through a single pole switch.
____ *11. Wired a receptacle fed from a lighting outlet through a three-way switch.

____*12. Wired a four-way switching situation with the supply line entering the lighting box.

____*13. Wired a range or dryer receptacle.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 10: Residential Services

Objectives: Upon completion of this unit, the student will:

*1. Identify parts of a service entrance.
*2. State clearances for service drops in varying situations.
*3. State the maximum number of service entrance disconnects allowed without having a main disconnect.
4. Describe the use of a transfer switch in a service entrance.
*5. Identify the different types of grounding electrodes.
*6. Describe service requirements for mobile homes with loads of 50 amps or less.
*7. Describe the service requirements for mobile homes with loads over 50 amps.
*8. Install an overhead raceway with service entrance conductors through meter base to load center or panel.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Taylor, Mark. Rev. by Don Blasingame and Gary Flowers. Residential Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Stallcup, James G. Designing Electrical Systems. Homewood, IL: American Technical Publishers. 1986.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify five parts of a service entrance.
*Objective 2: The student will state clearances for service drops in the following situations: over roofs and from the ground vertically.
*Objective 3: The student will state the maximum number of service entrance disconnects allowed without having a main disconnect.
Objective 4: The student will describe the use of a transfer switch in a service entrance.

*Objective 5: The student will identify four different types of grounding electrodes.

*Objective 6: The student will describe service requirements for mobile homes with loads of 50 amps or less.

*Objective 7: The student will describe the service requirements for mobile homes with loads over 50 amps.

*Objective 8: The student will install an overhead raceway with service entrance conductors through meter base to load center or panel to NEC standards.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified parts of a service entrance.
____ *2. Stated clearances for service drops in varying situations.
____ *3. Stated the maximum number of service entrance disconnects allowed without having a main disconnect.
____ 4. Described the use of a transfer switch in a service entrance.
____ *5. Identified the different types of grounding electrodes.
____ *6. Described service requirements for mobile homes with loads of 50 amps or less.
____ *7. Described the service requirements for mobile homes with loads over 50 amps.
____ *8. Installed an overhead raceway with service entrance conductors through meter base to load center or panel.

*Indicates core/essential objectives

COURSE: Electrician I

Unit 11: Trim Out and Troubleshooting

Objectives: Upon completion of this unit, the student will:

*1. State the grounding requirement for appliances.
2. List steps for panel trim out.
*3. State troubleshooting procedures.
*4. Troubleshoot an electrical circuit.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Taylor, Mark. Rev. by Don Blasingame and Gary Flowers. Residential Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will state the grounding requirement for appliances.
Objective 2: The student will list four steps for panel trim out.
*Objective 3: The student will state the four steps in troubleshooting procedures.
*Objective 4: The student will troubleshoot an electrical circuit which has been disabled by the instructor.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Stated the grounding requirement for appliances.
____ 2. Listed steps for panel trim out.
____ *3. Stated troubleshooting procedures.
____ *4. Troubleshot an electrical circuit.

*Indicates core/essential objectives

ELECTRICIAN II

Developed by

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Robert Logue, Hinds Community College - Vicksburg-Warren Branch
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ELECTRICIAN II

Unit No.	Title
1	Orientation and Safety Review
2	Special Tools and Equipment
3	Transformers
4	Wiring Design
5	Motors
6	Controllers
7	Programmable Controls

COURSE: Electrician II

Unit 1: Orientation and Safety Review

Objectives: Upon completion of this unit, the student will:

1. Identify local program and vocational center policies and procedures.
*2. List personal safety rules for working in a shop.
*3. List general safety rules.
4. Describe the proper use of the different classes of fire extinguishers on the different classes of fires.
*5. Identify uses of the colors of the Safety Color Code.
6. State the steps in lifting an object safely.
*7. List safety practices for step ladders, extension ladders, scaffolds, and power lifts.
*8. List factors to consider in storing hazardous materials.
9. Identify hazardous materials that may be found on a job site.
*10. State basic electrical safety practices.
*11. State safety practices for working with live circuits.
*12. Identify statements concerning proper grounding.
*13. Identify statements concerning the importance of the third wire.
*14. Describe the use of ground fault interrupters.
*15. Identify steps to follow in treating a victim for electrical shock.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan; Flowers, Gary; and Don Blasingame. Basic Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will identify local program and vocational center policies and procedures as determined by the instructor.
*Objective 2: The student will list seven personal safety rules for working in a shop.
*Objective 3: The student will list 16 general safety rules that apply to shops and work sites.

Objective 4: The student will describe the proper use of each different class of fire extinguishers on the different classes of fires.

*Objective 5: The student will identify two uses of the six colors of the Safety Color Code.

Objective 6: The student will state three steps in lifting an object safely in their proper order.

*Objective 7: The student will list eight safety practices for step ladders, extension ladders, scaffolds, and power lifts.

*Objective 8: The student will list four factors to consider in storing hazardous materials.

Objective 9: The student will identify two hazardous materials that may be found on a job site.

*Objective 10: The student will state ten basic electrical safety practices.

*Objective 11: The student will state five safety practices for working with live circuits.

*Objective 12: The student will identify four statements concerning proper grounding.

*Objective 13: The student will identify three statements concerning the importance of the third wire.

*Objective 14: The student will describe three factors relating to the use of ground fault interrupters.

*Objective 15: The student will identify four major steps to follow in treating a victim for electrical shock.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ 1. Identified local program and vocational center policies and procedures.
____ *2. Listed personal safety rules for working in a shop.
____ *3. Listed general safety rules.
____ 4. Described the proper use of the different classes of fire extinguishers on the different classes of fires.
____ *5. Identified uses of the colors of the Safety Color Code.
____ 6. Stated the steps in lifting an object safely.
____ *7. Listed safety practices for step ladders, extension ladders, scaffolds, and power lifts.
____ *8. Listed factors to consider in storing hazardous materials.
____ 9. Identified hazardous materials that may be found on a job site.
____*10. Stated basic electrical safety practices.
____*11. Stated safety practices for working with live circuits.
____*12. Identified statements concerning proper grounding.
____*13. Identified statements concerning the importance of the third wire.

____*14. Described the use of ground fault interrupters.
____*15. Identified steps to follow in treating a victim for electrical shock.

*Indicates core/essential objectives

COURSE: Electrician II

Unit 2: Special Tools and Equipment

Objectives: Upon completion of this unit, the student will:

*1. Identify the types of conduit benders.
*2. Identify wire and cable pulling equipment.
*3. Identify conduit cutting and threading tools.
*4. Identify knockout cutters.
*5. Bend, cut, ream, and thread rigid metal conduit.
*6. Bend EMT stub-ups.
*7. Make back to back bends on EMT.
*8. Make offset bends on EMT.
*9. Bend a three-point saddle on EMT.
*10. Bend a four-point saddle on EMT.
*11. Cut, ream, offset, and install connectors on PVC.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan and Flowers, Gary. Commercial and Industrial Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify three types of conduit benders.
*Objective 2: The student will identify five pieces of wire and cable pulling equipment.
*Objective 3: The student will identify four conduit cutting and threading tools.
*Objective 4: The student will identify three knockout cutters.
*Objective 5: The student will bend, cut, ream, and thread rigid metal conduit to specifications.
*Objective 6: The student will bend EMT stub-ups to specifications.
*Objective 7: The student will make back to back bends on EMT to specifications.
*Objective 8: The student will make offset bends on EMT to specifications.
*Objective 9: The student will bend a three-point saddle on EMT to specifications.

*Objective 10: The student will bend a four-point saddle on EMT to specifications.
*Objective 11: The student will cut, ream, offset, and install connectors on PVC to specifications.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified the types of conduit benders.
____ *2. Identified wire and cable pulling equipment.
____ *3. Identified conduit cutting and threading tools.
____ *4. Identified knockout cutters.
____ *5. Bent, cut, reamed, and threaded rigid metal conduit.
____ *6. Bent EMT stub-ups.
____ *7. Made back to back bends on EMT.
____ *8. Made offset bends on EMT.
____ *9. Bent a three-point saddle on EMT.
____*10. Bent a four-point saddle on EMT.
____*11. Cut, reamed, offset, and installed connectors on PVC.

*Indicates core/essential objectives

COURSE: Electrician II

Unit 3: Transformers

Objectives: Upon completion of this unit, the student will:

*1. Define the term "floating ground."
*2. Name different types of grounding systems used in the electrical trades.
*3. Identify basic types of transformers.
*4. Identify the most commonly used voltage systems.
*5. State NEC requirements for each basic type of transformers.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan and Flowers, Gary. Commercial and Industrial Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will define the term "floating ground" by describing how it is used in commercial service.
*Objective 2: The student will identify four types of grounding systems that are approved under NEC.
*Objective 3: The student will identify three basic types of transformers.
*Objective 4: The student will identify the two most commonly used voltage systems.
*Objective 5: The student will state two NEC requirements for each basic type of transformers.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Defined the term "floating ground."
____ *2. Named different types of grounding systems used in the electrical trades.
____ *3. Identified basic types of transformers.
____ *4. Identified the most commonly used voltage systems.

____ *5. Stated NEC requirements for each basic type of transformers.

*Indicates core/essential objectives

COURSE: Electrician II

Unit 4: Wiring Design (Materials, Load Calculations, Lighting, etc.)

Objectives: Upon completion of this unit, the student will:

*1. Describe branch circuit and feeder installation.
2. Identify the parts of a buss-duct installation.
3. Identify the parts of a cable tray installation.
*4. Determine the number of conductors allowed to be added to an existing conduit.
*5. Describe methods for mounting boxes in commercial installations.
6. State characteristics of each of the basic types of lighting.
*7. Change a two lamp ballast in a florescent fixture.
*8. Change sockets in a florescent fixture.
*9. Change an HID ballast.
10. Change a quartz lamp.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan and Flowers, Gary. Commercial and Industrial Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will describe four requirements for branch circuit and feeder installation.
Objective 2: The student will identify seven parts of a buss-duct installation.
Objective 3: The student will identify seven parts of a cable tray installation.
*Objective 4: The student will determine the number of conductors allowed to be added to an existing conduit.
*Objective 5: The student will describe two methods for mounting boxes in commercial installations.
Objective 6: The student will state two characteristics of each of the three basic types of lighting.
*Objective 7: The student will change a two lamp ballast in a florescent fixture.
*Objective 8: The student will change sockets in a florescent fixture.

*Objective 9: The student will change an HID ballast.
Objective 10: The student will change a quartz lamp.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Described branch circuit and feeder installation.
____ 2. Identified the parts of a buss-duct installation.
____ 3. Identified the parts of a cable tray installation.
____ *4. Determined the number of conductors allowed to be added to an existing conduit.
____ *5. Described methods for mounting boxes in commercial installations.
____ 6. Stated characteristics of each of the basic types of lighting.
____ *7. Changed a two lamp ballast in a florescent fixture.
____ *8. Changed sockets in a florescent fixture.
____ *9. Changed an HID ballast.
____ 10. Changed a quartz lamp.

*Indicates core/essential objectives

COURSE: Electrician II

Unit 5: Motors

Objectives: Upon completion of this unit, the student will:

1. Discuss direct-current motor theory of operation.
2. List types of DC motors.
*3. Discuss single phase motor theory of operation.
4. List types of single phase motors.
*5. Discuss three-phase motor operation.
6. List types of three-phase motors.
*7. Describe reversing rotation of a three-phase motor.
*8. List typical supply voltages for three-phase motors.
*9. Identify dual voltage schematics and terminal connections for motors.
10. List remedies for motor problems.
*11. State safety rules for working with motors.
12. List types of contactors.
*13. Identify parts of a manual contactor.
*14. Identify electrical devices and circuits controlled by magnetic contactors.
*15. Identify types of motor starters and their parts.
*16. State uses of magnetic motor starters.
17. Distinguish between a magnetic motor contactor and a magnetic motor starter.
*18. Interpret nameplate information on a motor.
*19. Use the NEC to answer questions about motor control circuits.
*20. Disassemble, inspect, and clean a motor.
*21. Identify run, common, and start terminals on a hermetically sealed motor.
*22. Test capacitors with an ohmmeter.
*23. Wire a three-phase motor for dual voltages.
*24. Perform maintenance on a magnetic motor starter or contactor.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan and Flowers, Gary. Commercial and Industrial Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will discuss three principles of direct-current motor theory of operation.
Objective 2: The student will list three types of DC motors.
*Objective 3: The student will discuss two principles of single phase motor theory of operation.
Objective 4: The student will list four types of single phase motors.
*Objective 5: The student will discuss three principles of three-phase motor operation.
Objective 6: The student will list three types of three-phase motors.
*Objective 7: The student will describe the principle of reversing rotation of a three-phase motor.
*Objective 8: The student will list three typical supply voltages for three-phase motors.
*Objective 9: The student will identify dual voltage schematics and terminal connections for delta-wound and wye wound motors.
Objective 10: The student will list three possible remedies for four common motor problems.
*Objective 11: The student will state seven safety rules for working with motors.
Objective 12: The student will list the two types of contactors.
*Objective 13: The student will identify seven parts of a manual contactor.
*Objective 14: The student will identify four electrical devices and circuits controlled by magnetic contactors.
*Objective 15: The student will identify the two types of motor starters and their parts.
*Objective 16: The student will state three uses of magnetic motor starters.
Objective 17: The student will state a distinguishing difference between a magnetic motor contactor and a magnetic motor starter.
*Objective 18: The student will interpret nameplate information on a motor to determine the following information: horsepower rating, electrical phased used, rpm, recommended voltage, overload protection, operating temperature, cycles per second rating, and motor type.
*Objective 19: The student will use the NEC to answer questions about motor control circuits related to overcurrent protection, control conductors protection, and "insight."
*Objective 20: The student will disassemble, inspect, and clean a motor following industry accepted practices.
*Objective 21: The student will identify run, common, and start terminals on a hermetically sealed motor.
*Objective 22: The student will test capacitors with an ohmmeter.

*Objective 23: The student will wire a three-phase motor for dual voltages to NEC standards.
*Objective 24: The student will perform maintenance on a magnetic motor starter or contactor.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ 1. Discussed direct-current motor theory of operation.
____ 2. Listed types of DC motors.
____ *3. Discussed single phase motor theory of operation.
____ 4. Listed types of single phase motors.
____ *5. Discussed three-phase motor operation.
____ 6. Listed types of three-phase motors.
____ *7. Described reversing rotation of a three-phase motor.
____ *8. Listed typical supply voltages for three-phase motors.
____ *9. Identified dual voltage schematics and terminal connections for motors.
____ 10. Listed remedies for motor problems.
____*11. Stated safety rules for working with motors.
____ 12. Listed types of contactors.
____*13. Identified parts of a manual contactor.
____*14. Identified electrical devices and circuits controlled by magnetic contactors.
____*15. Identified types of motor starters and their parts.
____*16. Stated uses of magnetic motor starters.
____ 17. Distinguished between a magnetic motor contactor and a magnetic motor starter.
____*18. Interpreted nameplate information on a motor.
____*19. Used the NEC to answer questions about motor control circuits.
____*20. Disassembled, inspected, and cleaned a motor.
____*21. Identified run, common, and start terminals on a hermetically sealed motor.
____*22. Tested capacitors with an ohmmeter.
____*23. Wired a three-phase motor for dual voltages.
____*24. Performed maintenance on a magnetic motor starter or contactor.

*Indicates core/essential objectives

COURSE: Electrician II

Unit 6: Controllers

Objectives: Upon completion of this unit, the student will:

*1. Identify wiring and ladder diagram symbols.
*2. Construct a basic ladder diagram.
*3. Complete a ladder and wiring diagram of a two-wire control using a thermal switch.
*4. Draw a ladder diagram of a three-wire control with an "on" indicating pilot light.
*5. Draw a ladder and wiring diagram of a three-wire control with an "off" indicating pilot light.
*6. Determine the number and size of conductors needed to operate a two-wire control system.
*7. Determine the number and size of conductors needed to operate a three-wire control system.
*8. Wire a two-wire control.
*9. Wire two float switches to operate a starter. (series connection)
*10. Wire two float switches to operate a starter. (parallel connection)
*11. Wire a pressure switch to operate a starter with "on" and "off" pilot lights.
*12. Wire a three-wire control system.
*13. Wire a multiple station three-wire control.
*14. Wire a multiple station three-wire control with "on" and "off" pilot lights.
*15. Wire two starters in sequence.
*16. Wire two starters with auxiliary contact interlocking.
*17. Identify methods of jogging control.
18. Wire a jog through a lock-stop pushbutton.
*19. Wire a jog through a two-position selector.
*20. Wire a jog through a two-circuit pushbutton.
*21. Wire a reversing starter with one control station using a pushbutton and auxiliary contact interlocking.
*22. Wire a reversing starter with two control stations.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan and Flowers, Gary. Commercial and Industrial Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify 14 wiring and ladder diagram symbols.
*Objective 2: The student will construct a basic ladder diagram showing power supply, loads, switches, and a control relay.
*Objective 3: The student will complete a ladder and wiring diagram of a two-wire control using a thermal switch.
*Objective 4: The student will draw a ladder diagram of a three-wire control with an "on" indicating pilot light.
*Objective 5: The student will draw a ladder and wiring diagram of a three-wire control with an "off" indicating pilot light.
*Objective 6: The student will determine the number and size of conductors needed to operate a two-wire control system.
*Objective 7: The student will determine the number and size of conductors needed to operate a three-wire control system.
*Objective 8: The student will wire a two-wire control to NEC standards.
*Objective 9: The student will wire two float switches to operate a starter in series to NEC standards.
*Objective 10: The student will wire two float switches to operate a starter (parallel connection) to NEC standards.
*Objective 11: The student will wire a pressure switch to operate a starter with "on" and "off" pilot lights to NEC standards.
*Objective 12: The student will wire a three-wire control system to NEC standards.
*Objective 13: The student will wire a multiple station three-wire control to NEC standards.
*Objective 14: The student will wire a multiple station three-wire control with "on" and "off" pilot lights to NEC standards.
*Objective 15: The student will wire two starters in sequence to NEC standards.
*Objective 16: The student will wire two starters with auxiliary contact interlocking to NEC standards.
*Objective 17: The student will identify three methods of jogging control.
Objective 18: The student will wire a jog through a lock-stop pushbutton to NEC standards.

*Objective 19: The student will wire a jog through a two-position selector to NEC standards.
*Objective 20: The student will wire a jog through a two-circuit pushbutton to NEC standards.
*Objective 21: The student will wire a reversing starter with one control station using a pushbutton and auxiliary contact interlocking to NEC standards.
*Objective 22: The student will wire a reversing starter with two control stations to NEC standards.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified wiring and ladder diagram symbols.
____ *2. Constructed a basic ladder diagram.
____ *3. Completed a ladder and wiring diagram of a two-wire control using a thermal switch.
____ *4. Drew a ladder diagram of a three-wire control with an "on" indicating pilot light.
____ *5. Drew a ladder and wiring diagram of a three-wire control with an "off" indicating pilot light.
____ *6. Determined the number and size of conductors needed to operate a two-wire control system.
____ *7. Determined the number and size of conductors needed to operate a three-wire control system.
____ *8. Wired a two-wire control.
____ *9. Wired two float switches to operate a starter. (series connection)
____*10. Wired two float switches to operate a starter. (parallel connection)
____*11. Wired a pressure switch to operate a starter with "on" and "off" pilot lights.
____*12. Wired a three-wire control system.
____*13. Wired a multiple station three-wire control.
____*14. Wired a multiple station three-wire control with "on" and "off" pilot lights.
____*15. Wired two starters in sequence.
____*16. Wired two starters with auxiliary contact interlocking.
____*17. Identified methods of jogging control.
____ 18. Wired a jog through a lock-stop pushbutton.
____*19. Wired a jog through a two-position selector.
____*20. Wired a jog through a two-circuit pushbutton.
____*21. Wired a reversing starter with one control station using a pushbutton and auxiliary contact interlocking.
____*22. Wired a reversing starter with two control stations.

*Indicates core/essential objectives

COURSE: Electrician II

Unit 7: Programmable Controls

Objectives: Upon completion of this unit, the student will:

*1. Define terms associated with programmable controls.
*2. List programmable controller functions.
*3. Identify input devices for programmable controllers.
*4. Identify output devices for programmable controllers.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kaltwasser, Stan and Flowers, Gary. Commercial and Industrial Wiring. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1988.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will define the following terms associated with programmable controls: analog signal, counter, discrete, fiber optics, input, logic, networking, output, programmer, programmable controller.
*Objective 2: The student will list four programmable controller functions.
*Objective 3: The student will identify three types of input devices for programmable controllers.
*Objective 4: The student will identify three output devices for programmable controllers.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Defined terms associated with programmable controls.
____ *2. Listed programmable controller functions.
____ *3. Identified input devices for programmable controllers.
____ *4. Identified output devices for programmable controllers.

*Indicates core/essential objectives

STUDENT PERFORMANCE RECORD

ELECTRICIAN

ELECTRICIAN I

Student: _____

This record is provided as an alternative to the student performance records at the end of each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

Place a check by each objective the student achieved; you may wish to note the date that the student achieved the objective.

C = Core competencies.

____ C1. Listed job responsibilities of electrical workers.
____ 2. Identified employment opportunities for electrical workers.
____ 3. Identified local program and vocational center policies and procedures.
____ C4. Listed personal safety rules for working in a shop.
____ C5. Listed general safety rules.
____ C6. Described the proper use of the different classes of fire extinguishers on the different classes of fires.
____ C7. Identified uses of the colors of the Safety Color Code.
____ 8. Stated the steps in lifting an object safely.
____ C9. Listed safety practices for step ladders, extension ladders, scaffolds, and power lifts.
____ C10. Listed factors to consider in storing hazardous materials.
____ 11. Identified hazardous materials that may be found on a job site.
____ C12. Stated basic electrical safety practices.
____ C13. Stated safety practices for working with live circuits.
____ C14. Identified statements concerning proper grounding.
____ C15. Identified statements concerning the importance of the third wire.
____ C16. Described the use of ground fault interrupters.
____ C17. Identified steps to follow in treating a victim for electrical shock.
____ C18. Identified common and electrical specialty tools used in electrical trades and stated the use of each tool.
____ C19. Used a cutting/crimping tool.
____ C20. Measured objects using a rule.
____ C21. Identified classes of outlet boxes used in electrical wiring.
____ C22. Identified types of devices used in electrical wiring.
____ 23. Identified types of covers and plates used in electrical wiring.
____ 24. Identified types of supports and anchors used in electrical wiring.
____ 25. Defined terms associated with basic theory.
____ 26. Stated principles of electron flow.
____ 27. Stated the basic sources of generation.

____ 28. Traced the distribution route for electricity.
____ C29. Identified electrical schematic symbols.
____ C30. Distinguished between a diagram and a schematic.
____ C31. Identified letters and terms used in electrical formulas.
____ C32. Stated Ohm's law and its uses.
____ C33. Calculated voltage, amperage, and resistance using Ohm's law.
____ C34. Stated applications of DC circuits.
____ C35. Applied Ohm's law to DC.
____ C36. Stated characteristics of series circuits and calculated relationships.
____ C37. Stated Watt's law.
____ 38. Stated Kirchoff's voltage law.
____ C39. Stated characteristics of parallel circuits and calculated relationships.
____ 40. Stated facts concerning magnetism.
____ 41. Described how magnetism relates to principles of induction.
____ 42. Stated the characteristics of inductance.
____ C43. Listed principles of AC theory.
____ C44. Listed factors that determine the type and size of conductors.
____ C45. Stated characteristics of a good connection.
____ 46. Identified different types of connectors, terminals, and lugs.
____ C47. Identified types of cables used in the electrical field.
____ C48. Wired a single pole switch controlling a single lighting outlet with the supply line entering the switch box.
____ C49. Wired a single pole switch controlling a single lighting outlet with the supply line entering the outlet box.
____ C50. Wired a three-way switching situation with the supply line entering a single outlet lighting outlet.
____ C51. Wired a four-way switching situation with the supply line entering the outlet box.
____ C52. Identified symbols used in residential drawings.
____ C53. Identified electrical symbols used in residential drawings.
____ C54. Identified the different types of lines used in blueprints.
____ C55. Listed information commonly found in blueprint specifications.
____ C56. Stated minimum requirements for residential outlets.
____ C57. Calculated circuit loads and voltage drop of dwelling.
____ C58. Determined total connected load plus total demand load of a dwelling.
____ C59. Selected proper materials for a specific job.
____ C60. Listed the types of overcurrent protective devices.
____ 61. Described the operation of a single element and dual element time delay fuse.
____ 62. Named the different types of circuit breakers.
____ 63. Listed requirements for fuses of less than 600 volts.

____ 64. Listed requirements for circuit breakers of less than 600 volts.
____ C65. Identified installations that require GFCI protection.
____ 66. Identified types of safety switch enclosures.
____ 67. Identified types of load centers and enclosures.
____ 68. Identified load center accessories and stated the use of each.
____ 69. Identified parts of a fusible load center.
____ 70. Identified parts of a breaker load center.
____ C71. Stated safety rules for working around load centers and safety switches.
____ C72. Installed a safety switch.
____ C73. Wired a load center or breaker panel.
____ C74. Wired a receptacle circuit to load center.
____ C75. Named locations where at least one receptacle is required.
____ 76. Listed planning techniques when placing boxes on plans.
____ C77. Stated acceptable heights for boxes in various locations.
____ 78. Described the steps in installing boxes in exterior walls to be brick veneered.
____ C79. Described the required outlets for various living areas in a residence.
____ 80. Listed rules for electrical installations.
____ C81. Installed a device box when given cabinet height and wall covering.
____ C82. Installed a ceiling box when given ceiling covering thickness.
____ C83. Wired a switch controlled split-wired receptacle.
____ C84. Wired a receptacle fed from a lighting outlet through a single pole switch.
____ C85. Wired a receptacle fed from a lighting outlet through a three-way switch.
____ C86. Wired a four-way switching situation with the supply line entering the lighting box.
____ C87. Wired a range or dryer receptacle.
____ C88. Identified parts of a service entrance.
____ C89. Stated clearances for service drops in varying situations.
____ C90. Stated the maximum number of service entrance disconnects allowed without having a main disconnect.
____ 91. Described the use of a transfer switch in a service entrance.
____ C92. Identified the different types of grounding electrodes.
____ C93. Described service requirements for mobile homes with loads of 50 amps or less.
____ C94. Described the service requirements for mobile homes with loads over 50 amps.
____ C95. Installed an overhead raceway with service entrance conductors through meter base to load center or panel.
____ C96. Stated the grounding requirement for appliances.
____ 97. Listed steps for panel trim out.
____ C98. Stated troubleshooting procedures.
____ C99. Troubleshot an electrical circuit.

ELECTRICIAN II

Student: _____

This record is provided as an alternative to the student performance records at the end of each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

Place a check by each objective the student achieved; you may wish to note the date that the student achieved the objective.

C = Core competencies.

____ 1. Identified local program and vocational center policies and procedures.
____ C2. Listed personal safety rules for working in a shop.
____ C3. Listed general safety rules.
____ 4. Described the proper use of the different classes of fire extinguishers on the different classes of fires.
____ C5. Identified uses of the colors of the Safety Color Code.
____ 6. Stated the steps in lifting an object safely.
____ C7. Listed safety practices for step ladders, extension ladders, scaffolds, and power lifts.
____ C8. Listed factors to consider in storing hazardous materials.
____ 9. Identified hazardous materials that may be found on a job site.
____ C10. Stated basic electrical safety practices.
____ C11. Stated safety practices for working with live circuits.
____ C12. Identified statements concerning proper grounding.
____ C13. Identified statements concerning the importance of the third wire.
____ C14. Described the use of ground fault interrupters.
____ C15. Identified steps to follow in treating a victim for electrical shock.
____ C16. Identified the types of conduit benders.
____ C17. Identified wire and cable pulling equipment.
____ C18. Identified conduit cutting and threading tools.
____ C19. Identified knockout cutters.
____ C20. Bent, cut, reamed, and threaded rigid metal conduit.
____ C21. Bent EMT stub-ups.
____ C22. Made back to back bends on EMT.
____ C23. Made offset bends on EMT.
____ C24. Bent a three-point saddle on EMT.
____ C25. Bent a four-point saddle on EMT.
____ C26. Cut, reamed, offset, and installed connectors on PVC.
____ C27. Defined the term "floating ground."
____ C28. Named different types of grounding systems used in the electrical trades.
____ C29. Identified basic types of transformers.
____ C30. Identified the most commonly used voltage systems.

____ C31. Stated NEC requirements for each basic type of transformers.
____ C32. Described branch circuit and feeder installation.
____ 33. Identified the parts of a buss-duct installation.
____ 34. Identified the parts of a cable tray installation.
____ C35. Determined the number of conductors allowed to be added to an existing conduit.
____ C36. Described methods for mounting boxes in commercial installations.
____ 37. Stated characteristics of each of the basic types of lighting.
____ C38. Changed a two lamp ballast in a florescent fixture.
____ C39. Changed sockets in a florescent fixture.
____ C40. Changed an HID ballast.
____ 41. Changed a quartz lamp.
____ 42. Discussed direct-current motor theory of operation.
____ 43. Listed types of DC motors.
____ C44. Discussed single phase motor theory of operation.
____ 45. Listed types of single phase motors.
____ C46. Discussed three-phase motor operation.
____ 47. Listed types of three-phase motors.
____ C48. Described reversing rotation of a three-phase motor.
____ C49. Listed typical supply voltages for three-phase motors.
____ C50. Identified dual voltage schematics and terminal connections for motors.
____ 51. Listed remedies for motor problems.
____ C52. Stated safety rules for working with motors.
____ 53. Listed types of contactors.
____ C54. Identified parts of a manual contactor.
____ C55. Identified electrical devices and circuits controlled by magnetic contactors.
____ C56. Identified types of motor starters and their parts.
____ C57. Stated uses of magnetic motor starters.
____ 58. Distinguished between a magnetic motor contactor and a magnetic motor starter.
____ C59. Interpreted nameplate information on a motor.
____ C60. Used the NEC to answer questions about motor control circuits.
____ C61. Disassembled, inspected, and cleaned a motor.
____ C62. Identified run, common, and start terminals on a hermetically sealed motor.
____ C63. Tested capacitors with an ohmmeter.
____ C64. Wired a three-phase motor for dual voltages.
____ C65. Performed maintenance on a magnetic motor starter or contactor.
____ C66. Identified wiring and ladder diagram symbols.
____ C67. Constructed a basic ladder diagram.
____ C68. Completed a ladder and wiring diagram of a two-wire control using a thermal switch.
____ C69. Drew a ladder diagram of a three-wire control with an "on" indicating pilot light.

____ C70. Drew a ladder and wiring diagram of a three-wire control with an "off" indicating pilot light.
____ C71. Determined the number and size of conductors needed to operate a two-wire control system.
____ C72. Determined the number and size of conductors needed to operate a three-wire control system.
____ C73. Wired a two-wire control.
____ C74. Wired two float switches to operate a starter. (series connection)
____ C75. Wired two float switches to operate a starter. (parallel connection)
____ C76. Wired a pressure switch to operate a starter with "on" and "off" pilot lights.
____ C77. Wired a three-wire control system.
____ C78. Wired a multiple station three-wire control.
____ C79. Wired a multiple station three-wire control with "on" and "off" pilot lights.
____ C80. Wired two starters in sequence.
____ C81. Wired two starters with auxiliary contact interlocking.
____ C82. Identified methods of jogging control.
____ 83. Wired a jog through a lock-stop pushbutton.
____ C84. Wired a jog through a two-position selector.
____ C85. Wired a jog through a two-circuit pushbutton.
____ C86. Wired a reversing starter with one control station using a pushbutton and auxiliary contact interlocking.
____ C87. Wired a reversing starter with two control stations.
____ C88. Defined terms associated with programmable controls.
____ C89. Listed programmable controller functions.
____ C90. Identified input devices for programmable controllers.
____ C91. Identified output devices for programmable controllers.